



**National Aeronautics and
Space Administration**

**Software Independent Verification & Validation Facility
Fairmont, WV 26554**

**Office of Safety and Mission Assurance (OSMA)
Software Assurance Research Program (SARP)**

**Level I Technical Program Plan
(FY03 - FY05)**

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OSMA Software Assurance Research Program Level I Technical Program Plan

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1.0 INTRODUCTION

1.1. Purpose

As part of the Office of Safety and Mission Assurance (OSMA) Program Operating Plan (POP) for FY 2003, this Level I plan solicits participation of NASA Center personnel in the OSMA Software Assurance Research Program. Additionally, it describes the program's goals, objectives, and implementation strategy for FY03 – FY05.

1.2. Program Background

Sound software engineering is critical to all NASA strategic enterprises, yet as a discipline, it is relatively immature. NASA is confronted with increasing levels of system sophistication and complexity. In order to reliably control and safely operate these systems, a greater dependency is being placed on software. Recent incidents have shown that software reliability is as critical to mission success as hardware reliability. In contrast to hardware, the methods needed for developing, testing, and certifying mission critical software are not fully in place across NASA. There are relatively straightforward means of predicting and mitigating hardware failures, but software failure modes and reliability are more difficult to evaluate. NASA does not necessarily have all the tools needed to determine when testing is complete or even what conditions must be tested.

1.3. Program Goal

The primary goal of this research program is to provide NASA with the software assurance practices, methods, and tools needed to produce safe and reliable software. This program is designed to address fundamental software assurance problems in the field of software engineering primarily as it relates to software safety, quality, independent verification and validation (IV&V), testability, and reliability. It is intended to develop and transfer to NASA projects, software assurance practices, methods and tools to improve the quality of the software produced by and for NASA, and to assist NASA in becoming a leader in the development of safe and reliable, cost effective software.

1.4. Program Objectives

The objectives of the OSMA Software Assurance Research Program are to:

- a) Support promising new software assurance research that facilitates NASA missions.
- b) Support NASA's strategic goals of safer, better, faster, cheaper missions from a software standpoint.
- c) Identify, develop, adopt, and integrate software assurance "best practices" and research results into NASA programs to reduce software costs, improve delivery time, and increase software safety and quality.

1.5. Implementation Strategy

To meet the goal and objectives, the OSMA sponsors the SARP through the NASA Independent Verification and Validation (IV&V) Facility in Fairmont WV. The IV&V Facility assists in the research selection and provides technical and management oversight of the awarded research initiatives.

The OSMA SARP uses this Level I Program Plan to solicit participation by NASA Center personnel. To solicit proposals from universities and industrial organizations, the OSMA SARP will use the NASA Research Announcement (NRA) for Software Assurance Research.

1.6. Evaluation Criteria

Consistent with the above goal, objectives and strategy, research initiatives will be selected and funded based on the following criteria:

1. Potential contribution to mission success
2. Potential contribution to mission assurance
3. Relevance to IV&V, reliability and safety.
4. Relevance to existing or planned NASA programs and projects
5. Potential for technology transfer to other NASA or industry programs and projects
6. Uniqueness of the research
7. Clarity of objectives, methodology, and success criteria
8. Competency/experience of the researcher

1.7. Proposal Categories

The OSMA invites proposals for three categories of projects. The proposals will be evaluated using the criteria listed above.

Category 1: New initiatives

New initiatives comprise new ideas or new associations between developers and centers or novel research ideas. New initiatives tend to be risky but should relate to quality assurance issues or problems. For new initiative proposals, the uniqueness of the proposed research, potential benefit to NASA, and past researcher performance and competence will be considered more heavily than the other evaluation criteria.

Category 2: Renewed initiatives

Renewed initiatives aim to continue and mature previously funded initiatives. To ensure that the results of renewed initiatives have potential to be used in NASA software projects, it is strongly recommended that a proposal for a renewed initiative include endorsement from a NASA project stating the potential benefits to one or more specific NASA projects, or an endorsement from a NASA Center Safety and Mission Assurance (SMA) Office Director stating specific software quality assurance objectives addressed by the proposal. For renewed initiatives, the potential contribution to mission success and mission assurance will be considered more heavily than the other evaluation criteria.

Category 3: Transition projects

After successful development, the software assurance practices, methods, and tools developed by an initiative should be moved into use at NASA. To ensure that the results of a transition initiative will be used by NASA, it is required that a transition initiative proposal include a NASA software project manager as a key participant to ensure that their project adopts the software assurance practices, methods, and tools that are proposed to be matured. For transition projects, the potential for technology transfer and contribution to mission success will be considered most heavily.

1.8. Authority

The SARP is a delegated program. The OSMA Acting Associate Administrator oversees the SARP through a Delegated Program Manager (DPM). The DPM is responsible for the management of the OSMA SARP to include: establishing research objectives, chairing the proposal Selection Committee, evaluation and selection of proposals, financial management, and evaluation of research deliverables. Dr. Michael Greenfield, the OSMA Acting Associate Administrator, assigns Dr. Linda H. Rosenberg, Chief Scientist for Software Assurance, GSFC, as the DPM.

Goddard Space Flight Center (GSFC) procurement processes NASA HQ procurement requests. GSFC procurement has the authority to issue the NRA. The DPM has Source Selection Official authority for the NRA. The DPM creates a Selection Committee that has the authority to evaluate proposals and to provide recommendations to the DPM. The Selection Committee will include at a minimum a HQ representative and an IV&V Facility representative. The DPM oversees the IV&V Facility draft of the NRA, this Level I plan, and management of the evaluation process.

2.0 ROLES AND RESPONSIBILITIES

2.1. NASA's Strategic Enterprises

Aerospace Technology, Human Exploration and Development of Space, Biological and Physical Research, Earth Science, and Space Science have projects that benefit from the project application of the tools, techniques, methods, and processes developed through the OSMA software program

2.2. Office of Safety and Mission Assurance (OSMA) (Code Q)

The OSMA (Code Q) is the immediate customer for this research. Code Q provides the funding and delegates the implementation responsibility for the program to the NASA IV&V Facility. Code Q provides the Level I plan to Code B.

2.3. Chief Financial Office (Code B)

Code B distributes the Level I plan to the NASA Centers to communicate the plan to the Centers and to alert the Centers to the NRA.

2.4. Goddard Space Flight Center (GSFC)

GSFC is the administrative office for the NASA Research Announcement that will be used to solicit proposals from universities and industrial organizations. GSFC procurement personnel serve as contracting officers for awards to universities and industrial organizations.

2.5. NASA IV&V Facility

The IV&V Facility monitors the OSMA Software Assurance Research Program. The Facility drafts the Level I Technical Program Plan (this document) that serves as a call for NASA Center proposals. Upon receiving proposals, the IV&V Facility notifies the DPM who Chairs the Selection Committee. The Chair of the Selection Committee may contact members of the NASA Software Working Group (SWG) for proposal evaluation. The OSMA Acting Associate Administrator approves the selections made by the DPM.

The NASA IV&V Facility publishes in a Level II Operating Plan a list of the successful proposals resulting from this Level I plan and the NRA. The Level II Operating Plan also contains center-level funding distribution. (Note that the Level I plan can cover several fiscal years while the Level II Plan, which contains adjusted center-level funding, covers only the upcoming fiscal year.)

For university and industry proposals, the IV&V Facility drafts the NRA. GSFC procurement issues the NRA. Upon receiving university and industry proposals, the IV&V Facility notifies the DPM. The DPM instructs the Selection Committee to evaluate the

proposals. The DPM selects proposals for award. For successful university or industry proposals, GSFC procurement establishes appropriate instruments, such as grants or contracts.

Once the period of performance has begun, the IV&V Facility conducts quarterly program management reviews (PMRs) with each principal researcher. The IV&V Facility Research Lead is Kenneth McGill (304-367-8300, Kenneth.McGill@ivv.nasa.gov).

The IV&V Facility maintains a Web-based repository of initiative research results that have been approved for public dissemination by NASA. The IV&V Facility conducts an annual symposium in West Virginia to provide a forum for the initiative principal investigators to present their research results and to their peers. Attendance of all SARP principal investigators is required.

2.6. NASA Centers

All NASA Centers are invited to participate in this program. NASA individuals and organizations that wish to propose should draft a Center Software Initiative Proposal (CSIP). The CSIP provides the information required by HOWI 7410-Q030, OSMA Budget Formulation, Appendix B. The CSIP format can be downloaded from the IV&V Facility web page at <http://www.ivv.nasa.gov/publications/ci/index.shtml>. Contact the IV&V Facility Research Lead, Ken McGill, for more information.

2.7. Universities and Industry

Universities and industrial organizations working in conjunction with a NASA Center or directly with the IV&V Facility can propose to the NRA. For universities and industrial organizations, the GSFC procurement office will post the NRA for Software Assurance Research in the Commerce Business Daily (CBD) and the NASA Acquisition Internet Service (NAIS). The NRA can also be downloaded from the IV&V Facility Web page at <http://www.ivv.nasa.gov/publications/ci/index.shtml>.

2.8. Principal Investigators (NASA, University and Industry)

Principal Investigators are responsible for scheduling and executing quarterly PMRs with the IV&V Facility. Researchers will be required to give a monthly status report on their initiative(s), and will be required to present their findings at an annual symposium in West Virginia. The FY02 symposium is the first week of September 2002.

2.9. Resource Projections

The projected annual resources for the OSMA SARP are approximately 4.6 million dollars. These funds will be distributed approximately as follows.

- 61% NASA Center Research
- 16% University and Industry Research
- 12% West Virginia University
- 11% Contract Support and Management Overhead